Abstract

In 1993, Michael Taussig's *Mimesis and Alterity* revitalized the power of the mimetic faculty to craft a vision of nature that was neither the alienated subject of modern science nor the passively malleable medium of late twentieth-century social constructivism. In it, he drew explicitly on a tradition of earlier twentieth-century scholarship—Benjamin, Caillois, and Horkheimer and Adorno—that located within the mimetic faculty a way out of a techno-fetishized social milieu. This paper explores how mimesis has once again been endowed with revolutionary potential in the contemporary moment through the growing field of biomimicry. I show how mimesis promises a way toward an alternative future disconnected from human hubris and ecological catastrophe—and a way out of the conditions that have created the Anthropocene. I explore how this works in biomimetics, taking a detailed look at one of the champions of the biomimetic paradigm: the gecko's foot. But, I ultimately suggest that what has been so seductive about mimesis throughout history is that it offers a "way out" of political confrontation. In doing so, I argue mimesis too easily serves as a double mirror — rather than transforming production, nonhuman life at the level of biology becomes a force *for* production.

Elizabeth Johnson is a Research Fellow of Science, Technology and Culture with the Department of Geography at the University of Exeter. She is studying how new ties between the biosciences and technological innovation change how we understand life — and death — in the Anthropocene. She has authored several articles that explore how developing fields like biomimicry and biotechnology are making nonhuman life matter–culturally, economically and politically–in new ways. She is currently working on a book manuscript titled *Working Life: Biomimesis and the Politics of Biological Productivity*.

Introduction

The twenty first century began an era in which life—that of humans and nonhumans—appears constantly at risk. While the US continues its War on Terror and new threats to Western Imperialism have arisen in the form of the Islamic State and their affiliates, recent reports by climate scientists, marine ecologist, and bacteriologists leave little doubt that civilization will soon also confront not one, but several ecological crises. No doubt, the conditions of these aggregate crises will be unevenly distributed among human populations or ecosystems. Yet, as the chairman of the recent IPCC report on climate change noted, they will "leave no one [and, subsequently, no place] untouched" (Demetriou 2014).

The historical era characterized by these pending global crises has a proposed, but already well-established, name: the Anthropocene. Coined by Crutzen and Stroemer (2000) and

now under consideration as an official geologic stratum by the International Commission on Stratigraphy, the nomination of this era centralizes humans as a universalized *anthopos*. But it figures a human transformed. Arguably, the *anthropos* of the Anthropocene no longer stands as the master of her fate, but a casualty of history. Intensified agriculture, industrial capitalism, fossil fuel extraction, and nuclear weaponry—all of which once promised to enhance and secure life—now threaten it. As Timothy Morton has written, it is as if we have woken to discover that we are fully implicated in a chain of violence we had only hoped to diagnose.

Though fraught with multiple conceptual perils, many of which I detail below, the nomination of this era seems to confirm what so many theorists inspired by the tradition of immanent materialism have long insisted: there is “no outside,” no transcendent nature or spirit that can be set apart from human society, to which we might appeal for salvation. In Morton’s words, there is “nowhere to jump, no where that is sanitized and safe and free of things. Freedom must be sought, struggled for, within the ecological mesh in which we find ourselves implicated” (Beckett and Morton, 2012).

In the context of this Anthropocene, when our practiced techniques of preservation are known to place life at risk, is it possible still to imagine a "freedom" that can be "sought" and "struggled for"? And, if freedom—understood here as a way out of the conditions of fossil-fuel laden production that have generated our current ecological crisis—is not attainable, for what might a politics that resists the exploitation and degradation of life and land struggle? And how might it do so?

In what follows, I take up the field of biomimicry as one proposed response to these questions. Advanced by environmentalists and engineers, biomimicry sutures biology with technological engineering to create nature-inspired innovations. Viewed as a “key driver of

innovation" and a "game changer" in technological and material production, biomimesis offers a new framework of creation based on natural processes and evolutionary products. In doing so, it realigns our efforts of production with the productive powers of "life itself." Where traditional methods of industrial production have generated toxic waste, pollution, and climate change, now gecko feet, lotus leaves, spider silk, and countless other biological materials promise to inspire novel solutions to ecological and engineering problems. Much more than an agent of green innovation and natural capital, biomimicry offers a method of reconfiguring species hierarchies and rank in what Agamben (2004) has referred to as the anthropological machine. Through its practice, mimesis offers a "way out" not only of our biopolitical present, but also of the confining *anthropos* that gave birth to the Anthropocene.

The emerging contours of biomimicry's bio-techno-scientifc configuration offer a useful touchstone for thinking through a "struggle for freedom" in the context of the Anthropocene. But the promise of mimesis to offer a way out is not new. Almost coincident with the rise of biomimicry as a discipline, Michael Taussig (1993) resurrected the power of the mimetic faculty as a "magical" force that could craft a vision of nature that was neither the alienated subject of modern science nor the passively malleable medium of late twentieth-century social constructivism. Through a reappraisal of mimesis, he hoped to "break definitively from the fetishes and myths of commodified practices of freedom" and engender heightened attention to sensuous living in a more-than-human would (1993: 254).

Taussig's attempts to revitalize the power of mimesis drew explicitly on a tradition of earlier twentieth-century scholarship that located within the mimetic faculty the potential for dramatic transformations of human consciousness and social life. Walter Benjamin, Roger Caillois, and Max Horkheimer and Theodor Adorno all similarly encouraged returning to the

revolutionary power of mimesis in order to redraw connections among life on earth. For each of these authors, the mimetic faculty offered a way out of a techno-fetishized social milieu, artificially distanced from so-called natural origins. In the face of rapid social change in the early and mid-twentieth centuries, the mimetic faculty promised salvation from fascism *and* the advance of industrial capitalism (Shukin 2010), both of which threatened expressions of human life, human consciousness, and our relationship to nonhuman processes.

Elsewhere, I have examined the mismatch between the promise of biomimetic production and the limited conditions of its making through privatized capital (see Johnson 2010, Goldstein and Johnson 2014, Johnson and Goldstein 2015). Here I want to take up explicitly the political potential of mimesis itself as a means of generating alter-subjectivities in a time of seemingly immoveable politics and unescapable conditions of ecological crisis. I consider whether resurrecting the power of mimesis might be viewed a way toward an alternative future disconnected from human hubris and ecological catastrophe—and a way out of the conceptual and material conditions that have created the Anthropocene. But I also suggest that what is seductive about mimesis is that it also offers a "way out" of political confrontation, a way to liberate human subjectivity without oppositional consciousness, a freedom that, in Elizabeth Grosz's terms is not a "freedom from" a force of oppression but a "freedom to" self-actualize. I explore how this works in biomimetics, taking a detailed look at one of the champions of the biomimetic paradigm: the gecko's foot. I argue that in figuring as an antidote to politics, mimesis too easily serves as a double mirror — rather than transforming production, nonhuman life at the level of biology becomes a force *for* production. While biomimicry reconfigures how and what matter in contemporary capitalism, valuing life becomes ever more intensively a matter of capital, to be lauded for productive capacities alone. In the end, I look briefly to the literary

figure that has guided many accounts of the power of mimesis, Kafka's ape Rotpeter, to suggest that the problematic freedom presents is conditioned on the problem of "survival" rather than the conditions of life. Amid a global regime of biopolitics that now extends well beyond the human (see Johnson, forthcoming), the question of survival is no way out at all. If we are to confront the many paradoxes of living in the Anthropocene, we must develop not only a transformed consciousness, but one capable of confronting the operational conditions of life and its capacities to self-actualize across bodies, species, and spaces.

Reordering Rank: A Way Out of *Anthropos*

We are beginning to come to grips with the realities of climate change. As I write, the media stream near-constant updates on drought and California, storms across Texas, and rising death tolls from an unprecedented heat wave in India (2,500 as of 4 June 2015). It is increasingly clear that our strategies for managing life have gotten out of hand. This is true in the West in particular. We can no longer continue to deny that our methods for "making live" require that we make ourselves expendable. Industrial production and all of the biological and technological advances that have accompanied it continue to be tied to the burning of fossil fuels, chemical manipulation, nuclear weaponry, and wasteful effluents, all of which are viewed as threats to forms of life. The biopolitical conditions of the Anthropocene continue to leave a selection of humans within and outside of our borders in close proximity to death (Foucault 1990, 1995). But we also are eradicating thousands of the earth's species and are in the process of degrading the conditions of life generally, seemingly with little regard for place or scale. Somewhere between human bodies and our capacity to harness fire and fossil fuels, we have created conditions that are out of our hands, but amid which we are fully imbricated (see Clark 2011).

Freedom from these conditions contributing to life's degradation has historically taken one of two forms. The first is a freedom from the earth and the conditions that bind us to it, to particular geologic strata and other forms of life. This is a freedom sought from resource limitations and the negative consequence of our productive activity, freedom from our own waste. It is expressed through the spatial fix and the desire to escape ecological limits through mobility as well as through the pursuit of technological innovation in a desire to surpass those limits (Harvey 1982, 2001). This latter strategy is found in the proposals of geoengineering, in Elon Musk's radical investment in "disruptive technologies," and in the Breakthrough Institute's embrace of what they call eco-modernism. It is found in the seemingly pervasive dream that market deregulation will not only circumvent ecological disaster, but ensure that "by 2100, nearly all of us will be prosperous enough to live healthy, free and creative lives" (the Breakthrough Institute quoted in Angus 2015, np). The second is a freedom sought in the abandonment of degenerative social relations. It is found in the back to the land movement and desires to craft an exit from "the grid," including movements of radical domestication, intentional communities, and anarcho-primitivism.

Ongoing debates around the concept of the Anthropocene uncover each of these methods for the fantasies they are. They reveal the spatial fix as a shell game, raising questions about the reliance on the "free" market and technological innovation. These debates also abolish our conceptions of a nature to which we can return, an opportunity for salvation (Wark 2015). The naming of the Anthropocene therefore seems to have accomplished what so many cultural theorists and STS scholars have been driving home since the 1980s: the dissolution of the imagined and ideological divide between humans and nature (Haraway 2000[1984]; Smith 2010[1984]; Latour 1993). The social and material elements of our lives are wholly immanent to

one another. If the conditions of the earth—the very conditions in which we find ourselves—are the conditions for freedom, we might therefore consider another path. Arguably, that path may be already laid out in several critical appraisals of the Anthropocene concept.

Among environmental humanities and social science scholars, it is widely accepted that the narcissistic impulse and attendant ranking of species implicit in the nomination of the Anthropocene are primarily to blame for the ecological crises at hand (White 1967, Agamben 2003, Latour 1993, Haraway 2008, Griffney and Hird 2008, Barad 2010, Wolfe 2003, 2012). Accordingly, the term "Anthropocene" risks reproducing man as the figure central to this era and to the Earth generally. Its nomination seems to confirm modernist beliefs in a hierarchy of life that place humans unshakably at the apex. Read this way, advocates of the Anthropocene then can be seen as the promoters of humanity's most psychopathic tendencies. They would allow the very figure that has carried out ecological atrocities to be memorialized in the geologic record.

Just as troubling is the term's unification of *anthropos*. It evokes a "we," a we that worked together to give rise to the history of industrial production, nuclear weaponry, and fossil fuel extraction. It erases from the geologic record all those who have played little to no part in enacting these transformations of the earth. Similarly effaced are struggles against hegemonic modes of production, against war, violence, and ecological degradation. Further, the nomination of the era leaves unquestioned a long-held anthropocentrism latent in much scholarship on the social construction/production of nature that relegates the earth and its other-than-human inhabitants to the role of passive victims of (primarily human) social relations (Braun 2008, Clark 2011, Malm and Holmberg 2014, Yusoff 2015).[1] As a consequence, the Anthropocene encourages us imagine ourselves—once again—in the image of the accidental hero who either is projected forward to offer salvation to the future or thrust back in time to choose a different

option in the decisive moment, one that would have led humanity elsewhere (Colebrook 2014).[2] All of these critiques suggests that the conditions of our pending ecological crises have taken shape because the "human" of Western civilization has been full of itself—so full up of itself, in fact, that it registers the effects of its seemingly murderous intent as the product of its own heroic overcoming of nature.

In spite of this centralization of the human, however, this newly named era encapsulates what Kathryn Yusoff has described as a "heterogenous identity." The Anthropocene, for Yusoff, is paradoxically poised between the traditional structures of thought that accompany liberal humanism and a more expansive understanding of the unfolding of socio-material processes on earth. Rather than a reification of the human, the Anthropocene and the conversations surrounding it are also creating ways out of modernist narratives of human mastery. As Yusoff notes, "the Anthropocene contains within it a speculative humanism that is speculating on humanist trace-effects, be those the very concept of the human *itself* as an organizing structure of meaning or the normative organization of knowledge as being *for* rather than *without* a subject" (Yusoff 2015: 5, emphasis in the original, see also Ginn 2015 and Buck 2015). Yusoff argues that the nomination of the era gives birth to a new origin story for human life, encouraging a subjectivity "that redefines temporal, material, and spatial orders of the human (and thus nature)" (Yusoff 2015: 1). These debates suggest that the nomination of the Anthropocene may guide us to enact other modes of being, to find not only that nonhuman life and nonliving processes are constitutive of social life (a point that Latour has been making for decades) but also that, "humanity is a more-than-social configuration, differentiated by inhuman forces" (Yusoff 2015: 8).

Poised here to cautiously accept the name of this new era, we may begin to redefine "freedom" within it. Rather than a freedom from the earth, or a freedom from the toxic conditions of post-industrial society, we may begin to imagine struggling for freedom from the very notion of the human as we have long considered it. Following Elizabeth Grosz, we may consider the struggle for the planet part of an endeavor to free ourselves, where freedom is defined as the freedom of bodies to "become more than they are" (Grosz 2011: 72). Here we imagine becoming other, opening up the possibility that we might be inhuman rather than human, or that we might be driven (or even rendered) by forces that are both within and beside us (see Barad 2012).

Identifying the concept of the human as the locus for freedom is hardly new with the nomination of the Anthropocene (Chakrabarty 2009). Decentering narratives of progress and heroic production are the well-established in feminist and post-structuralist thought (Latour 1993; Whatmore 2004; Bennett 2008; Derrida 2008; Wolfe 2009; Barad 2010; Grosz 2011; Braidotti 2013). Roberto Esposito's writing on biopolitics makes a similar claim. To "liberate" freedom, he argues, we must re-bind it to the obligations named by the *munus* of *communitas.* We must embrace a sense of community no longer defined as a "locus of identity, belonging, and appropriation," but one of "plurality, difference, and alterity" (2013: 55). Doing so requires breaking the mirror "in which the self is reflected without seeing anything but itself" (Ibid.: 65).

If this is the kind of freedom for which we are to struggle in the Anthropocene, what is the method for doing so? Yusoff suggests that seizing the Anthropocene as a catalyst for installing anthropogenesis "into the history of rocks" will inaugurate new ways of telling human and earth histories. Ian Angus (2015) makes a similar recommendation to historicize the present in such a way that enables a future imaginary to be viewed through a lens other than that of capitalist

progress. But I want to return to an older narrative of constituting the self as other that has recently been reignited in the practice of biomimetic production. I want to return to earlier twentieth-century thinkers of mimesis as a potentially fruitful method for reconfiguring subjectivity.

In Michael Taussig's exploration of colonial ethnographic accounts, mimesis figures as the "nature that culture uses to create second nature, the faculty to copy, imitate, make models, explore difference, yield into and become Other." (xiii). The "sympathetic magic" of mimesis, he argued, could craft a nature that was neither the alienated subject of modern science nor the passively malleable medium of late twentieth-century social constructivism. For him, mimesis required intimate contact with the material world, creating joint between what was natural and made. Between objects and their reproductions, Taussig argued that mimesis shifted the locus of power in transformations in such a way that "the power of the copy [influences] what it is a copy of" (250). With such transformations, he hoped to "break definitively from the fetishes and myths of commodified practices of freedom" and engender heightened attention to sensuous living in a more-than-human world (254). By creating a joint between self and other, natural and artificial, mimesis puts the self out of joint. A method for decentering subjectivity, mimesis offered a "way out" of the human as imagined in the tradition of modern liberal humanism.

Taussig's celebration of mimesis was hardly new. In the early and mid-twentieth century, anxiety provoked by rapidly advancing technological reproduction, commodification, and the expansion of instrumental reason through machinic production brought mimesis to the fore of cultural theory. In "The Work of Art in the Age of Mechanical Reproduction" (1968 [1936]), for example, Benjamin analyzed novel techniques of visual mimesis through photography and film, its effect on the role of art, and its relationship to the public. Whereas the Romantics turned to

authenticity in art as antidote to the ills of industrial production and Enlightenment rationality, Benjamin found the potential for political awakening within the conditions of the present rather than the past. The still frame, the enlargement, the close up, and slow motion created new fields of apperception. They brought to life a new "structural formation of the subject" (1968: 236). In that new subject, Benjamin found the potential for expanding the field of social and political action. For Benjamin, the "fugitive and fleeting nature of playing at something" promised the realization that the original is just as much artifact as the copy—not a fiction, but a performance (Benjamin I968, 333; cf. Taussig 1993). Although they risked pacifying the masses, emerging technologies also promised something more: a truly participatory art. In Benjamin's other works, he located political potential of reproduction in the mimetic faculty even more explicitly, arguing that it served as the foundation for creating a collective, revolutionary human consciousness. As Susan Buck-Morss (1991) notes, technological reproduction made it possible for Benjamin to envision an end of bourgeois attachments to individual contemplation, aesthetic expression, and most of all, the myth of progress. Mimesis could thus free us "from the spell of capitalism" (Buck-Morse 1991: 275) and generate new forms of collective enchantment capable of reactivating working class politics and the dream of revolution.

In *The Dialectic of the Enlightenment*, Horkheimer and Adorno (2002 [1944]) similarly explored the potential for revolutionary awakenings through the power of mimetically transformed human-environmental relations. For them, the indignities of twentieth century capitalism as well as the rise of Fascism and National Socialism were products of the Enlightenment's separation between humans and nature, a separation made possible by the repression and perversion of the mimetic faculty. From Francis Bacon on, "men of science" conflated knowledge with mastery and manipulation. In doing so, Horkheimer and Adorno

argued that they metamorphosed nature into a unified "substratum of domination." Its multifaceted forms were transformed into commensurable, fungible elements. Like Benjamin, Horkheimer and Adorno blamed twentieth-century expressions of domination on the attendant emergence of bourgeois education institutions, which protected men "from reincorporation into variety of circumambient nature" (2002: 181). Bourgeois society, for Horkheimer and Adorno, could thus be characterized by a fear of infection through contact. This required the renunciation and control of the mimetic faculty, which the bourgeois subject, they argued, channeled into a practice of "controlled reflection" (2002: 181): "civilization has replaced the organic adaptation to others and mimetic behavior proper, by organized control of mimesis…uncontrolled mimesis is outlawed" (2002: 180).

Horkheimer and Adorno's writing was untimely. Today, they can be seen as early authors of the Anthropocene, writing after it had begun, but half a century before it would be named. As they wrote in 1944:

> The cerebral organ, human intelligence, is firmly established enough to constitute a regular epoch of the earth's history. In this epoch, the human species, including its machines, chemicals, and organizational powers—for why should they not be seen as a part of it as teeth are a part of the bear, since they serve the same purpose and merely function better?—is the last word in adaptation. Humans have not only overtaken their immediate predecessors but have eradicated them more thoroughly than almost any other recent species" (Horkheimer and Adorno 2002: 184).

What they objected to was the very biopolitical double bind in which we currently find ourselves, by way of which we "owe the serum which the doctor administers to the sick child to the attack on defenseless creatures" (2002: 185). But the two were not interested in fighting for a

future pure of contradictions or biopolitical turbidity. What they hoped for was an overturning of the continuous appeal to measure, to free mystery and myth from its suppression by the numerical management of things.

Horkheimer and Adorno only vaguely gesture to the revolutionary potential of returning to what they refer to as an "originary" mimesis. When they do, they link mimetic behavior with criminal activity. Unlike the prison systems, Horkheimer and Adorno lauded the criminal's capacity "to lose oneself in the environment instead of playing an active role in it; the tendency to let oneself go and sink back into nature." Citing Freud's death instinct and Roger Caillois's writings on mimesis, Horkheimer and Adorno claim that the act of "yielding" to the world is essential to criminal violence as well as art, suggesting that mimesis serves as a necessary link between art and rupture.

In this emphasis on yielding through mimesis the reader finds a latent post- or anti-humanism that draws heavily on Caillois's earlier essay "Mimicry and Legendary Psychasthenia" (2003 [1935]). Capable of breaking the binary between "real" and "imagined," Caillois referred to mimicry as a "reciprocal mapping" born of an instinct of letting go (Caillois 2003: 97). Caillois was inspired by the posturing of insects as they perform "a sort of insertion into the plant world." Extending the analysis to humans, Caillois writes that by making oneself a mimic, "one's sense of personality is quickly, seriously undermined" (2003: 100). Like Yusoff's writings on the inhuman elements of the social and the social elements of the inhuman, Caillois celebrated such insertions. More than a hybridized, bi-lateral re-coordination, Caillois viewed mimicry as a method for radical dis-coordination, a means for unmooring organisms and subjectivities such that they "no longer knew what to do with [themselves]" (2003: 99). For Caillois, the mimetic faculty served to unite subjects with their surroundings and reveal the

artifice of difference and distinction, just as the Anthropocene reveals the artifice of human and nonhuman, social and geologic.

Each of these authors viewed the reconfigurations of human selves in relation to nonhumans as the central component in identifying a way out of socio-historical binds. What Taussig and his predecessors advocated in theory, the field of biomimicry seems poised to put into practice. In the following section, I show how biomimicry invites us to rethink the power of mimesis in the context of the twenty-first century's biopolitical present. In doing so, I evaluate the promise of biomimicry to deliver a way out of the conditions of the Anthropocene and its *Anthropos.*

Biomimicry: Creating new joints for life in the Anthropocene

The field of biomimicry sutures technology and nature together, ostensibly not to appropriate or extract, but to recognize life's capacities of invention. Against a nature figured as objectified, passive, or instrumental, the field's advocates argue that biomimesis forces us to recognize the "genius" of nonhuman life. Through its practice, the unthought processes of nonhuman life are not merely viewed as "indifferent" (Clark 2011), recalcitrant to human efforts at domestication or commodification (Bakken 2004), or simply in possession of a naturalized "actancy" or *agencement* (Latour 2005). Rather, nonhuman processes express a level of coordination that is "good," "well-purposed," knowledgeable about "best practices." Nonhuman life, advocates argue, is better skilled at producing worlds than are we. In a moment of ecological instability that increasingly calls "life" and its productions into question, this method of mimesis offers a "way out" of our ecological constraints by offering a "way in" to nonhuman life more fully. Not only does biomimetic practice encourage a heightened sensual awareness of life in a more-than-human world. It also promises that we might "let go" of presumed hierarchies of life.

Perhaps the best place to begin an appraisal of these emerging joints between human and nonhuman production is at a sites of mimetic (re)production. In 2010, I toured Elan Golas's mechanical engineering laboratory, where he and his students were in the process of putting the final touches on the gecko-inspired Stickybot Version 3. If Descartes infamously anticipated a future in which we would construct machines indistinguishable from animals, Golas's Stanford lab has taken steps in that direction. At that moment, there was still no mistaking the machine for an actual gecko. Rather than a moving system encased in folds of reptilian skin, the Stickybot appeared as a collection of exposed computer chips and hard plastic parts joined together with multi-colored wiring. Yet, Golas's Stickybot had a number of qualities that served to make it—as Descartes would have expected—"of the nature" of geckos. Even as the soft whirring sound of moving gears accompanied each step, the robot's gait, modeled on gecko movement, gave it an uncanny grace. The most striking feature of the device, however, was its feet. Its footpads were flesh-like, made of a synthetic polymer developed in-house. Looking at those feet, the physical difference between animal and machine seemed to evaporate, as if the robot ended in gecko at the ankles.

From a scientific point of view, how geckos stick is extraordinary. It was in the late nineteenth century that Johannes Dederik van der Waals first described the apparent viscosity of neutral or similarly charged atoms. While his description of intermolecular force attraction has been substantially revised over the past century and a half, we still refer to the forces of cohesion as "van der Waals forces." Today, scientists attribute the bond of neutrally charged molecules to the movement of electrons around the nucleus of an atom. As electrons move, the electric charge of atoms fluctuates. When two bodies of a similar kind come into close enough proximity, these charge fluctuations "dance" in rhythm with one another, creating a temporary polarity. This

attraction forms a loose and temporary bond as electrons move together in synchronization (Parsengian 2006).

Although Van der Waals forces are essential for our understanding of how liquid and gas molecules interact, physicists consider this bond between atoms to be feeble (Parsengian 2006). In everyday life we have little reason to treat this interaction as anything other than an abstract theory in particle physics. Consider, for example, the molecules that make up the surface of your skin as they meet those that constitute a water glass. As you place your fingers around the barrel, they may join together for a brief moment, balancing the fluctuation of their charges and bringing your skin into intimate contact with the glass surface. But their momentary marriage registers no felt effect. We might attribute this insignificance of van der Waals forces to the infinitesimal magnitude of their binding force. But recent research has suggested that making van der Waals attraction matter materially is a question not of the force of the bond, but of scale and surface topology. In pressing your fingers to the sides of a glass, it may *seem* that your skin conforms to its surface. At the micro and nano scale, however, both fingers and glass are pocked with ridges, craters, and valleys. The intervening space between them is so great that the points of contact are relatively few, leaving little opportunity for van der Waals attraction to generate any felt effect. This is true for the majority of bodies in the world, whether animate or inanimate.

It is not true for geckos.

Most amphibians and insects adhere to walls and tree trunks using friction, capillary adhesion, hooked structures on their legs, or some combination of all three. Frogs, for example, secrete a mucus-like material that helps to secure a bond with trees, rocks, and other surfaces. Geckos, however, do not produce adhesive; the pads of their feet *are* adhesive. In fact, a recently dead gecko sticks to walls just as easily as a live one (Forbes 2005). This is because a single

footpad of a gecko is covered with hundreds of thousands of tiny hairs, called setae. Arranged in rows called lamenae, these setae reach densities up to 5300/mm2. Each seta is one-tenth the diameter of human hair and, at its end, each splits into several hundred smaller "spatula." German zoologist Uwe Hiller was the first to suggest that it was the configuration of these tiny hairs on the feet of the gecko that allowed for its adhesion (Autumn, et al. 2000). But this remained conjecture—along with several other theories of how geckos stick—until researchers at UC Berkeley in the late 1990s experimented with the adhesive force of gecko setae, publishing their results in the June 08, 2000 issue of *Nature* (Autumn, et al. 2000). Their experiments measured the adhesive force of a single gecko seta detached from the living gecko and glued to the end of an insect pin. They found that the hairs on the gecko's footpad achieve maximum conformity with the topography of *any* surface, reducing the atomic gap distance between the material of gecko skin and that which it encounters. Geckos take hold of the world at the level of its atoms (Autumn, et al. 2002). As they crawl up a wall, the tiny hairs on their toes join momentarily with its surface.

Human bodies are uniquely empowered by our capacity to harness "geopower," as Grosz has put it. In spite of all subsequent technoscientific productions, however, our bodies remain impoverished compared to many of the earth's other creatures. In our efforts to join objects together, for example, we have learned to tie, weld, solder, fasten, rivet, or apply chemical adhesives to act as a bond. Adhesives--the most versatile and cost-effective method for joining materials of different kinds--work by bonding one surface to another through polymerization. Chemical polymers are versatile, but limited. They are often sensitive to high heat or exposure to water. They lack the strength of welded or soldered joints. And their production and use are often toxic. Engineers have long hoped to innovate new materials that might overcome these and other

limitations. Recently, they have turned to bioscience. Not only geckos, but also mussels and clams now offer inspiration. As these engineers and advocates of biomimicry have hoped, these efforts to transform adhesive technologies are creating new ways of joining not only things, but also human and nonhuman relations in the process. It is no longer the geopower needed to produce chemical adhesives that we want to harness. Instead, we want to walk like the gecko, to join walls by reorganizing geometric structures. By learning from the gecko, we create new joints between humans and nonhumans, as well as techniques for seeing and reproducing forms of life. Capable of breaking the binary between human and nonhuman as well as natural and produced, biomimetic practice enacts a reordering of the world, of forms of life and forms of technological matter.

This way of viewing biomimicry's capacity to transform the world and how we engage with it is the aim of biomimicry's most ardent advocates. Janine Benyus, author of the 1997 publication, *Biomimicry: Innovation Inspired by Nature*--a foundational text for the movement—is particularly keen to reorganize production through the mimetic faculty. Her initial book emerged out of frustration with contemporary conditions of production. It opens with an epigraph taken from Vaclav Havel's 1984 essay "Politics and Consciousness": "We must draw our standards from the natural world. We must honor with the humility of the wise the bounds of that natural world and the mystery which lies beyond them, admitting that there is something in the order of being which evidently exceed all our competence" (quoted in Benyus 1997: 3).

Benyus's organization, Biomimicry 3.8 (for 3.8 billion years of "evolutionary research and development" on earth), works to showcase the power of biomimetic innovation. Using its sister site, AskNature.org, one can learn how butterfly wings can inspire low-energy device screens, how scientists are mimicking shark skin to create low drag swimsuits and anti-biotic

surfaces, how water might be harnessed from the air using the "help" of beetles. But more than improving upon the products that we have, or creating better, greener commodities, Benyus's brand of biomimicry seeks to rethink the very processes of material production themselves. Unlike humans, Benyus argues, nonhuman species create conditions suited for the reproduction of their own life (and often those of others), joyfully: "life creates conditions conducive to life. It builds soil, it cleans air, it cleans water, it mixes the cocktail of gases that you and I need to live. And it does that in the middle of having great foreplay and meeting [its] needs" (Benyus 2005).

Benyus avows that biomimetic production will precipitate the death of what she refers to as *Homo industrialis*; that it will generate a new, ecologically sustainable paradigm of human-nonhuman co-production. Referring to contemporary human-environment relations as "autistic", Benyus argues that a creating a joint between humans and nonhumans--through mimesis--is necessary to alter our connection to the earth, to create a "way out" of the conditions of the Anthropocene. Rather than a unified "substratum of domination" or collection of resources to be extracted, biomimicry renders nonhuman life a collaborative participant in production, capable of "genius" that, in many cases, is greater than that of humans. Biomimicry creates a framework for producing the kind of "infection through contact" that Horkheimer and Adorno wished to reclaim. This form of mimesis allows the alien of biological life to become familiar through the language and forms of technological innovation. And through this technological production, we may come to enhance our capacity to be affected by the surrounding world, to see ourselves as a part of it.

Even more, biomimetic technologies and their production promise to engender--as Caillois so fervently hoped--a "letting go" of sedimented notions of the human. As Benyus has written, "perhaps in the end it will not be a change in technology that will bring us to the

biomimetic future, but a change of heart, a humbling that allows us to be attentive to nature's lessons…. If we are to use our tools in the service of fitting in on Earth, our basic relationship to nature—even the story we tell ourselves about who we are in the universe—has to change" (Benyus 1997: 8). In short, biomimicry is thought to be capable of expanding life—enhancing it—by disrupting human subjectivity, solving not only our ecological crisis, but also the problematic social and political conditions that have led to them in the first place. In Benyus's writings and lectures, we once again find the capacity for mimetic affiliations between humans and nonhumans capable of generating a revolutionary subjectivity who will free us from the "spell" of ecological degradation and modernism.

Biomimetic practice offers the hope that we might co-join with nonhuman life by adopting its processes, forms and procedures. It promises that we might join with nonhuman life as geckos join with walls—in a way that sticks. In taking hold of the world with gecko feet, we might begin to let go: to let go of imagining ourselves as the sole bearers of "genius"; to break free from imagining our species as the sole producers of anything more than life itself. Biomimicry, seen in this way, will ostensibly catalyze new subjectivities and redefine "the temporal, material, and spatial orders of the human (and thus of nature)" (Yusoff 2015: 1). Here, the way out is a way back in--a way into the lives of other organisms, as the earth's processes are fully and intentionally integrated into processes of production.

The Hall of Mirrors: Making Productive Life

"For a time I rest in the grace of the world, and am free"

-Wendell Berry

Such an approbatory view of biomimesis might leave us hopeful rather than fearful of the coming future. Like the Anthropocene, however, biomimicry presents a paradox: on one hand, it

breaks down common conceptions of the human, reconfiguring rank and order among living beings. Viewed through a different light, however, the practices of biomimicry promise only to reinforce our superiority. After all, is a better expression of human hubris imaginable than the belief that we can reproduce the forms of nonhuman life in the service of social production? Biomimetic technologies are designed to enhance, to supplement. The practice of biomimicry may place us beside ourselves, but it is also often designed to take us beyond ourselves, beyond the limits of our bodies, in pursuit of technological enhancement. In many cases, biomimicry figures as part of a drive for trans-humanism and the creation of a technological infrastructure that only intensifies, rather than dismantles, our current biopolitical order.

The gecko's foot highlights these conflicting reflections on the human and the troubling concept of "freedom" in light of them. Since the early 2000s, research into gecko feet has been funded in part by the US Defense Advanced Research Project Agency (DARPA). The rise of urban military conflicts in the twentieth century made finding a "way out" of street-level firefights a pressing concern for the Department of Defense. In places like Mogadishu, Baghdad, and Mosel, military forces faced structures that difficult to scale, move through, or see around (Graham 2009).[3] In addition to Stickybot and the development of commercial adhesives, DARPA's Z-Man project seeks to develop "gecko suits" so that humans can learn to scale "a vertical surface while carrying a full combat load" (Z-Man nd: http://www.darpa.mil/Our_Work/DSO/Programs/Z_Man.aspx). While these explorations with the gecko's foot may offer "a way out" in the environment of urban warfare by learning to walk like geckos, they do little to challenge the status quo of geopolitical and biopolitical hegemony. Given that, it seems too much to ask that we imagine that the US military will be transformed

through the kind of mimetic infection that Horkheimer and Adorno desired. Instead this may be the exact kind of "controlled mimesis" that they had feared.

The military's appropriation of biomimetic technologies may not be the most concerning element of this resurgent interest in mimesis. In spite of these political realities, we could retain hope for mimesis yet. After all, biomimicry still offers a method for "reworking the detritus" of the Anthropocene and its circuits of technological production. Through its practice, we may well learn to disconnect ourselves from entrained patterns of extraction and petroleum-based production. But if we have rested our optimism for biomimesis (and the Anthropocene) on its potential to transform the subjectivity of humans, this too may be a false promise. The rhetoric of biomimicry's advocates establishes an alternative hierarchy in place of our traditionally humanist one. Appeals to nonhuman forms of life as a means of generating new parameters of worth and value in production smuggles in a view of nature as pure, perfect, and something to which we—and our modes of production—can return. In doing so, evolutionary processes become a new measure of value that can serve as a substitute for exchange.

Consistent with the promise of the mimetic faculty, we find ourselves here in a hall of mirrors (Willerslev 2007). What is artificial and natural is again made confusing. But now, it is the attribution of value to nonhuman forms that is indistinguishable from economic value. Biomimicry then serves as a legitimation of production, a way of insisting that life *is* production, is productive, ought to be relentlessly producing goods and services for the earth. Indeed, biomimicry offers the perfect solutions to the problems of contemporary capitalism: in an environment in which industrial manufacturing continues to decline in the US, the rise of profits from the patenting of intellectual property has made fields like neurology, micro-biology, and macro-biology highly lucrative. Biomimicry recasts nonhuman evolution as a bottomless well of

potential products and processes. In biomimicry, it is not natural scientists that extend their view to technology, but a techno-scientific worldview that fetishizes production that extends its view to all of nonhuman life and its processes. Like the Anthropocene, biomimicry attempts to "conceptually traverse the gap between the natural and the social – already thoroughly fused in reality – through the construction of a bridge from one side only, leading the traffic, as it were, in a direction opposite to the actual process" (Malm 2014: xx).

This seems unlikely to overturn the problematic nature of the Enlightenment and instrumental reason that Horkheimer and Adorno described. Rather, it seems an intensification. Through biomimesis, nature is repackaged again in unified form. This time, however, it is not made universal as a "substratum of domination," but rather a universally productive, interchangeable series of capacities and traits. Here then, rank is not overturned, but reproduced through a different metric of accounting. Biomimicry reformulates life in relation to production by rendering life valued for its function rather than form. This is not the problem of "controlled mimesis" but the chaos of the hall of mirrors. In it, the reproduction of capitalism and the reproduction of organisms becomes indistinguishable. Therefore, rather than elevating the nonhuman, or eliminating a violent hierarchical divide, the discourses of the biomimicry may simply make all forms of life—and our knowledge of them—equivalent through the measure of exchange. As Jason Read writes in an analysis of biopolitics, biomimicry may serve only to "increase productivity while at the same time reducing the condition and causes for revolt" (Read 2003: 141) by equating capitalist production with the production and reproduction of life. The trans-species subjectivities produced through biomimetic practices therefore emerge not as "unruly" or as a challenge to dominant orders production. Instead, they simply become entrepreneurial.

This also has implication for how we think of human-nonhuman forms of cooperation, communication, and other "infoldings," intentional or otherwise. As forms of life fall under this regime of measure, so too do the times in and through which we interact with them. Rather than producing spaces outside of the times of capitalist production, every moment—including a child's "large blocks of unstructured time for making mud pies and finding nests, for acting on the fascination with nature that is part of our reptilian mind" (Benyus 1997: 288) —become moments in which innovation for capital can be produced, in which exchange value can be made and accumulated. Every moment becomes a moment of potential labor and potential production, innovation is latent in every instant. The only "way out"—the only way to achieve freedom from the conditions of ecological precarity—seems to be the embrace of constant production. Wendell Berry's sense of freedom found at rest "in the grace of the world" becomes unthinkable. Rather than freedom, these transformations in human-nonhuman sociabilities and subjectivities are more likely to ignite considerations of the great magnetism of exchange value and its seeming inescapability. For, as Isabelle Stengers has written, this alone is capable of "radically aligning disparate practices and values…for it is radically indifferent to whatever binds them and is itself bound by nothing, even its own axioms of the moments, which have nothing at all [to] do with requirements or obligations" (Stengers 2010: 74).

Conclusion: Beyond Survival in the Anthropocene

Throughout the twentieth and now early twenty-first centuries, mimesis seems a seductive method for imagining ways out of troubling political knots. Mimicry promises to set us free from the sedimented subjectivities to which history has seemed so bound. But the true power of mimesis may be reside in its capacity to offer solace from the troubles of those political knots in the first place. It suggests that we need only to embrace radical alterity—in any form—in

order to carve a "way out" of the conceptual and political messiness of a biopolitical present. Just as Benjamin, Horkheimer and Adorno, and Caillois of mid-twentieth century Europe turned to the "magic" of the mimetic faculty as a means of thinking a way out of an increasingly tight space between fascism and the expanding forces of capitalism (Shukin 2010), the hopeful musings of Benyus and other advocates of biomimicry express a similar condition. This time, mimicry serves as an escape valve from a global ecosystem in increasing jeopardy and the mode of production that placed it at risk. But, rather than a way out, perhaps mimesis only offers an easy out. It suggests that we might rely on resident knowledge—expressed through this joint between humans and nonhumans—to define the contours of social and ecological justice. Biomimicry enables us to imagine that we might "choose life" while never needing to ask (or answer) the question, "which life?" (Neyrat 2010). It assumes that the answer will be apparent, undeniable. In doing so, however, biomimicry risks only expanding capitalist value as if to demonstrate that evolution and capitalist production have been walking in lockstep all along.

Biomimicry is compelling in part because of the narrative that evolution "works" to create optimal forms, that life "knows" best practices. And that we should follow it without contestation. Perhaps biomimicry's most radical act form might reside in mimicking not only nature's "genius," but also its absurdities, redundancies, and sometimes failings. Perhaps the "way out" is to put breaks on the relentless drive for innovation and production by celebrating the non-productive and the profligate in life. This may require a view of evolutionary history that does not imagine it as "research and development," but rather views it as another biomimeticist, Steven Vogel does, as a process of "thoroughly stupid" tinkering (Vogel 1998: 22). Darwin himself famously referred to natural selection as "clumsy, wasteful, [and] blundering" (Darwin 1865: np). Perhaps there is hope in the hall of mirrors, but only when we are capable of seeing

natural selection not as a drive toward optimal performance, but the genetic expression of bricolage: a process through which organisms "make do" with their genetic heritage and the environmental conditions in which they find themselves. Moreover, evolution is seldom solely about survival or the passing on of reproductive traits. It is also about the—often unintelligible—tastes and sexual preferences of conspecifics, predators, prey, and a host of interlocking creatures and chemical processes. By entering the hall of mirrors to mimic with multiple forms of animal life, we might produce an attentiveness that may give rise to an alternative view of life's value. That is, we may better equip ourselves with the capacity to engage politically in conditions of life.

What does this all mean for the "struggle for freedom" in the Anthropocene? To tie these threads together I want to return to the mascot of mimesis, Kafka's ape Rotpeter in "A Report to an Academy" (1971). In Kafka's story of the ape that apes human-being, Rotpeter demonstrates to the academy the falseness of human exceptionalism. This is an ape who aped his "way out" of bondage through an acceptance of radical alterity: the behaviors and speech patterns of his captors. Faced with continuing to live under unlivable conditions and death, Rotpeter performs a kind of self-annihilation via mimesis.

The literature on the Anthropocene and the hopeful advocates of biomimicry suggest that this is the very process that we, as humans must undergo. We must annihilate ourselves so that we might continue to survive, to live anew. When faced with the question of "which life" we seem to want to respond: not this one. In focusing on life and survival—the bio of biopolitics--we seem all too easily charmed by ourselves and our capacities to "become otherwise," whether on our own or by creating joints with nonhuman others. Like the soldier facing concrete walls, we have narrowed in on framing things in terms of survival. As individuals, as species, we aim to

survive. To do "what ever it takes" to find a way out, to locate a notion of "freedom" as defined through the conditions for survival. This is what happens when we imagine ourselves in the Anthropocene as an already impoverished moment, one already conditioned by an apocalypse that waits (perhaps eternally) on the horizon. If we position ourselves there, as captives in the conditions of ecological change, we already foreclose on our options and opportunities. We find ourselves searching for a "way out" from impossible choices: dictatorship or geoengineering; colonizing Mars or living the post-Apocalypse. But the Anthropocene opens on to a future far from settled, one in which considerable surpluses of life and its conditions remains in spite of massive extinctions. The real questions that we need to be asking are not about our subjectivities, and more about the processes by which we are organizing the human and inhuman elements of social life. If we are to confront the many paradoxes of living in the Anthropocene, we must develop not only a mimetic consciousness, but one that is also oppositional to the conditions of capitalist production—and the relentless drive for productivity--in which we find ourselves.

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[1] As numerous scholars have further noted, the era's naming also implicitly naturalizes the historical events that have constituted the ecologic and geologic changes wrought over the past several centuries. Malm and Hornberg (2014) describe this paradox succinctly, noting that the writing on the Anthropocene has, on one hand *denaturalizes* climate change by relocating it "from the sphere of natural causes to that of human activities." But that same literature has *renaturalized* anthropogenic climate change on the other, by attributing it to "an innate human trait, such as the ability to control fire" (4).

[2] Proposed alternatives to the "Anthropocene" include the Capitalocene (Moore 2014, Malm), the Age of Oil, and Donna Haraway's proposal to call this the Cthulucene. She would name this age not for HP Lovecraft's "misoynist racial-nightmare monster Cthulhu" but after the "diverse earth-wide tentacular powers and forces and collected things" that bring together and entangle "myriad temporalities and spatialities and myriad intra-active entities-in-assemblages" (Haraway 2015: 160).

[3] Consider, for example the Israeli Defence Forces' (IDF) method of hunting down Palestinian guerrillas in the city of Nablus in 2002. Described as "inverse geometry" the IDF sought out enemies of the Israeli state by moving "horizontally through walls and vertically through holes blasted in ceilings and floors" (Weizman, E 2006: http://www.frieze.com/issue/article/the_art_of_war/). Not wanting to produce that

level of destruction in Iraq or Afghanistan (it would not, after all, win over "hearts and minds"), the US military has attempted to confront this issue by developing what they have called "total information awareness" gleaned from a combination of advanced satellite technology, surveillance cameras, and communication devices. To date, the technology is not enough advanced to produce the desired results (see Graham 2008).

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